3M Company Health Information Systems

Capturing and Integrating Patient Healthcare Information to Improve Accessibility

The healthcare industry has faced challenges in adopting new computer technology to track patient data. Changes in the industry have made it more important than ever to adapt information infrastructures so that patient records and related data are accessible to a variety of healthcare professionals, regardless of their locations or the types of systems they use. In 1995, 3M Company Health Information Systems applied for co-funding from the Advanced Technology Program (ATP) to further develop the technology necessary to bring this information infrastructure to market. With ATP funding and its own capital, 3M developed revolutionary technologies that allow healthcare providers not only to maintain their investments in legacy systems, but also to migrate demographic and clinical information into a clinical data repository. The technology, marketed in several 3M products, is now used by more than 150 healthcare facilities nationwide.

COMPOSITE PERFORMANCE SCORE
(based on a four star rating)
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Research and data for Status Report 94-04-0027 were collected during October - December 2001.

Healthcare Industry Faces Challenges

The U.S. healthcare industry faces the challenge to provide higher quality, lower cost service to an increasing number of customers. Information technology is seen as a valuable tool in reaching this goal. The medical field, however, is large, complex, and growing rapidly. Moreover, it is difficult to reduce operating costs and improve productivity levels because of factors such as institutional culture, interoperability issues, and business processes. Nevertheless, healthcare reform drives the need for interoperability within the industry, and healthcare institutions are recognizing the need to improve the exchange of data among their various operating entities and the wider healthcare community.

During the mid-1990s, information management within the industry was not integrated, and patient information was often not readily accessible at the point of care. Healthcare professionals spent a great deal of time looking for records or repeating tests simply because they could not find previous test results in a timely manner. Infrastructure throughout the industry was fragmented, with individual institutions using unique diagnostic systems, internal data formats, patient record systems, and communication and computer networks. The healthcare industry needed systems that would ensure reliability, maintainability, and data integrity, as well as a high level of confidence that patient data would be available for every authorized healthcare professional 24 hours a day, 7 days a week. The lack of a complete infrastructure, combined with the technical risk inherent in developing systems to complete these tasks, prevented many commercial entities from attempting to make advancements in this area.

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The reengineering of medical information technology systems promised significant economic benefits and cost savings for healthcare organizations and patients. According to a 1992 study conducted by the

Department of Health and Human Services, a nationwide electronic healthcare information network had the potential to save $100 billion over eight years, with more than half of the savings attributed to a reduction in both the number of diagnostic tests ordered and the length of hospital stays.

The Clinical Data Repository Promises Infrastructure Integration

In 1995, when 3M submitted its proposal to ATP, many disparate systems were used to store and transmit patient records data and other information within the healthcare industry. Various healthcare system vendors were beginning to develop central data repositories (CDRs) (later renamed clinical data repositories), but most of these CDRs offered limited capabilities with varying degrees of reliability, usability, and accessibility. Moreover, the healthcare industry faced the challenge of integrating information systems and automating data exchange processes across organizational components.

The objective was to maintain computer-based patient records in CDRs, which would contain the patient's lifetime records.

Development of a CDR required a computer-based patient record. This record is the electronic format that holds data with standard components, such as the patient's demographic information, active problems, family history, test results, clinical observations, active medications, allergies, and any images and documents that accompany apatient's record. The objective was to maintain computer-based patient records in CDRs, which would contain the patient's lifetime records. 3M Health Information Systems conceptualized a system that would allow healthcare providers to maintain their investments in their legacy systems and migrate demographic and clinical information into a CDR.

3M Proposes to Accomplish Four Tasks

3M applied for funds under ATP's Information Infrastructure for Healthcare program to develop an infrastructure that would capture patient data, integrate it into a knowledge base, and make it accessible to the appropriate parties. The company believed that there

CDRs will help to increase the quality of patient care and provide continuity.

was a good fit between ATP's objectives outlined in this program and 3M's development goals. Therefore, 3M submitted a proposal to ATP that included developing and testing the following components:

- A common medical data dictionary to facilitate the reliable storage and retrieval of complex medical information, the contents of which would be integrated to form a CDR.
- Terminology that would ease the translation of different medical coding schemas.
- Database object development that would allow the data dictionary components to function across an organization's entire computer network.
- An alert writer that would route patient messages to caregivers on the basis of alerts written directly by clinicians.

Collectively, these components would achieve something that had not yet been accomplished in the healthcare industry: access to data by multiple individuals at various locations, regardless of the type of system each was using. This effort would rely on a terminology program that would be created to provide a universal dictionary for common medical terminology.

3M Achieves Technical Success

During this two-year ATP project, 3M completed the four tasks summarized above. The company achieved its project goals by developing a prototype and conducting beta testing at a number of hospitals. Based on the feedback that 3M gained through prototyping, the company developed "plug-and-play" interoperability

between applications, or components of applications between the database objects, and the healthcare data dictionary.

CDR Becomes Part of 3M's Care Innovation System

Since completion of the project in 1997, 3M has leveraged the technology to further develop its healthcare information system products. The company has incorporated the components developed through this ATP-funded project into other development activities within 3M. It markets the technology as part of its Care Innovation (CI) System (formerly called the Healthcare Enterprise Management System), along with the company's established applications such as the 3M Clinical Workstation. Through further development, 3M has commercialized new software packages that use this technology. According to the company, the software will become the foundation for the Department of Defense Military Health System's computer-based patient record program, which is aimed at improving healthcare delivery to military personnel. The CI System is currently being used in more than 150 healthcare facilities. Additional marketing efforts are under way to encourage other vendors to embed pieces of the CDR functionality into their systems.

CDR Benefits Extend to End Users

The end users of 3M's CDR have benefited from its use without having to make a substantial investment in new systems. Many healthcare providers were able to protect their investments in legacy systems and migrate demographic and clinical information by linking together previously installed systems rather than having to install new ones. Two institutions that have realized benefits from the CDR are Health Partners of Southern Arizona (HPSA) and Driscoll Children's Hospital.

HPSA successfully used CDR to unite all of its care facilities using a single source for information. HPSA needed one central patient index with common identifiers and a way to ensure accuracy, integrity, and encoding of the data. The central patient identifiers and translation of data into common nomenclature offered by the CDR enabled HPSA to reach this goal and achieve economies of scale.

Driscoll Children's Hospital, a regional pediatric referral medical center with offices throughout rural areas in southern Texas, used the CDR technology to solve the challenges of sharing data among geographically dispersed locations while preserving its original investment in its legacy systems. CDR seamlessly integrated data from Driscoll Children's Hospital and clinics into individual, longitudinal patient records. The system helps to provide Driscoll clinicians with expert decision support tools at the point of care, which can make a difference in both outcomes and cost.

Conclusion

The ability to demonstrate the components of this ATP project through prototypes and beta tests helped the Health Information Systems division of 3M garner support from within 3M to internally fund additional developments. Furthermore, based on the support it received from ATP, 3M was able to introduce this technology into the healthcare marketplace two years ahead of schedule. According to 3M, "The work that was accomplished with the help of ATP in the Information Infrastructure for Healthcare focused program, along with access to NIST technologists with standards experience, gives us the capability to respond to market needs."

PROJECT HIGHLIGHTS
3M Company Health Information Systems

Project Title: Capturing and Integrating Patient Healthcare Information to Improve Accessibility (Healthcare Lifetime Data Repository Infrastructure [later renamed the Clinical Data Repository])

Project: To establish key elements of a technology infrastructure that would make it possible to integrate incongruent systems throughout the healthcare industry. These elements include a common medical data dictionary that allows for the storage and retrieval of complex medical information; a code translator that facilitates ease of translation among different coding systems; an object-oriented database element that implements a data dictionary into individual healthcare enterprises; and an expert alert system that allows clinicians to write alerts that are sent when conflicts occur in the patient data.

Duration: 2/1/95-1/31/97
ATP Number: 94-04-0027

Funding (in thousands):**

ATP Final Cost	$1,196	15%
Participant Final Cost	7,890	85%
Total	$9,086	

Accomplishments: 3M accomplished all of the technical goals it defined in its ATP proposal. In addition, the company installed prototypes of the CDR in healthcare facilities throughout the United States and beta tested the functionality of its technology components at conferences and in real-life settings. More than 150 healthcare customers currently use this technology to track patient records.

Commercialization Status: 3M has incorporated the components of this project into other corporate development activities. The company is marketing the components as part of its CI System, along with the company's established applications such as the 3M Clinical Workstation. Through further development, 3M has commercialized new software packages that use the ATP-funded technology. According to 3M, the software will become the foundation for the Department of Defense Military Health System's computer-based patient record program, which is aimed at improving healthcare delivery to military personnel. The CI System is currently being used in more than 150 healthcare facilities, and additional marketing efforts are under way to encourage other vendors to embed pieces of the CDR functionality into their systems.

Outlook: The outlook for this technology is excellent. 3M is continuing to build upon the CDR and to pursue new and innovative high-risk technologies through a subsequent project with ATP. 3M hopes other vendors will continue to embed some of the functionality of these components into their systems to move the healthcare industry closer to true interoperability.

Composite Performance Score: * *

Number of Employees: 85 employees at project start, 85 as of December 2001.

Focused Program: Information Infrastructure for Healthcare, 1994

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** As of December 9, 1997, large single applicant firms are required to pay 60% of all ATP project costs. Prior to this date, single applicant firms, regardless of size, were required to pay indirect costs.